

## III.

CONTRIBUTIONS FROM THE CRYPTOGAMIC LABORATORY  
OF HARVARD UNIVERSITY.XXI.—NEW GENERA AND SPECIES OF LABOULBENIACEÆ,  
WITH A SYNOPSIS OF THE KNOWN SPECIES.

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IN attempting some years since to obtain materials for a monograph of the Laboulbeniaceæ, the writer did not anticipate that a fifth preliminary paper would be reached before he felt in a position to publish a general account of the family; yet, however much the description of so large a number of new forms without proper figures is to be regretted, the delay in this respect seems fully justified by the essential data which have been obtained during the past two years. It cannot be doubted that the number of existing forms greatly exceeds the total already known, but it seems safe to assume that the basis of knowledge now available is sufficient to illustrate, at least in a general way, the more important characteristics of the group from a morphological as well as a systematic point of view. The promised monograph will therefore be published as soon as the necessarily numerous plates can be completed; and since a sixth preliminary paper will, if possible, be avoided, a summary of the known genera and species is appended for convenience of reference, together with a very brief note concerning certain matters relating to the general morphology and development of the group.

The writer's observations, based upon an examination of several thousand specimens illustrating more than a hundred species and more than twenty genera, appear to warrant the following conclusions.

The Laboulbeniaceæ, while showing no signs of any non-sexual mode of reproduction, are characterized by a well marked sexual type, closely resembling that of the simpler Floridææ. They are ascomycetous fungi, producing usually four, sometimes eight spores in asci

which arise by a peculiar process of budding from ascogenic cells, of which there may be from one to four, usually distinct and eventually free within the cavity of the perithecium.

The ascogenic cells are developed from a carpogonium consisting of a single axile cell which is fertilized by non-motile male bodies (antherozoids) through the agency of a more or less highly developed trichogyne from which it is separated by a second axile cell. After fertilization the carpogonic cell divides by transverse septa (in ascertained cases) into three cells, the middle cell becoming either directly an ascogenic cell or dividing into from two to four such cells, while the other two supporting cells eventually disappear.

The trichogyne varies from a simple vesicular receptive prominence, or short filament, to a copiously branched and highly developed organ, the numerous free receptive tips of which may be coiled in close and regular spirals. The trichogyne, the insertion of which is usually terminal, disappears immediately after fertilization is accomplished, however highly it may be developed, its insertion becoming lateral by the further development of the perithecium.

The antherozoids appear to originate in two genera exogenously from special branches. In all other genera they are produced endogenously in antheridia, the form and position of which vary in the different genera. The antheridia are either single specialized cells, which may be more or less irregularly disposed or characteristically grouped, or may consist of more highly developed multicellular bodies. In either case the antherozoids are discharged through a terminal pore in the form of rod-like or nearly spherical masses of naked protoplasm.

The sexes are commonly both present on the same individual, usually so placed that self-fertilization is readily accomplished, or may be completely separated on specialized individuals. In the latter case of the members of any given spore pair formed in an ascus and discharged simultaneously from the perithecium one produces a male, while the other produces a female individual, thus insuring the juxtaposition of the sexes at the new point of infection.

The spores which may be formed in pairs within the asci, or less definitely disposed, are of one general type, fusiform in shape and divided by a more or less well defined septum into two parts, the relative position of which in formation is reversed in development, the segment which is basal in relation to its position in the ascus becoming distal in its relation to the growing plant resulting from its germination. A well defined gelatinous envelope surrounds the spore when mature, and develops with the growing plant to form a sac-like

covering continuous over all its parts with the exception of the pore of the perithecium and certain portions of the sexual organs, its formation being independent of the cell divisions which take place inside it.

The new forms described below include a portion of the novelties collected during the past summer, and are distributed among the genera as follows: *Ceratomyces*, two species; *Teratomyces*, two species; *Cantharomyces*, one species; *Peyritschiella*, one species; *Dichomyces*, two species; *Heimatomyces*, one species; *Dimorphomyces*, one species; while the four new genera described, *Sphaleromyces*, *Moschomyces*, *Camptomyces*, and *Compsomyces*, include each a single species. As in previous instances, the writer is indebted to the kindness of Mr. Henshaw for the determinations of hosts.

*CERATOMYCES HUMILIS*, nov. sp.

Hyaline becoming faintly tinged with brownish. Perithecium rather narrow, without any appendage, the apex blunt or nearly truncate, its cell rows composed of not more than seven cells. Receptacle composed of from two to five superposed squarish cells. Appendage consisting of six to twelve superposed cells, the series tapering distally and producing irregularly from its inner face branches which may in turn be several times branched and may reach a length twice that of the perithecium. Spores  $22 \times 3 \mu$ . Perithecia  $100 \times 25 \mu$ . Total length to tip of perithecium  $150-185 \mu$ . Longest branches of appendage  $180 \mu$ .

On legs and at the edges of the elytra of *Berosus striatus* Say. Kittery Point, Maine.

A somewhat insignificant species allied to *C. contortus*, from which it is easily distinguished by its small size and by the absence of any appendage near the tip of the perithecium. It occurs more frequently between the terminal claws of the middle pair of legs, but is rarely found on the elytra. In two specimens the perithecia have become distinctly tinged with brown, but as a rule the whole plant is hyaline.

*CERATOMYCES TERRESTRIS*, nov. sp.

Nearly hyaline with black or dark brown suffusions. Perithecia large, slightly inflated, tapering to a bluntly rounded or truncate apex from which the sharply pointed lips project: the wall of the perithe-

cium consisting of four series of about twelve cells each, its base formed from three small cells, below which a single similar small cell connects it with the receptacle. Receptacle consisting of three small superposed squarish cells, the upper of which gives rise to the perithecium and the appendage. The appendage, consisting of six or more superposed flattened cells becoming externally suffused with blackish brown or black (the suffusion sometimes involving the whole series as well as the entire receptacle with the exception of its basal cell), bearing on its inner side numerous hyaline branches which may in turn be once or twice branched, the lower arising from a series of small cells which may extend across the base of the perithecium on one side. Spores  $15 \times 2.5-3 \mu$ . Perithecium  $75-90 \times 22-29 \mu$ . Receptacle  $25 \mu$  long. Total length to tip of perithecium  $100-140 \mu$ , to tip of main appendage  $45-65 \mu$ . Longest branches of appendage  $75 \mu$ .

On *Lathrobium punctulatum* Lec. Kittery Point, Maine.

This minute and curious species is chiefly interesting from the fact that it is a terrestrial form in a typically aquatic genus, of which, however, it seems to possess all the essential characters. Unlike most of its congeners, it is among the smallest of all the Laboulbeniaceæ, and is very readily overlooked.

### SPHALEROMYCES, nov. gen.

Receptacle consisting of two superposed cells, the distal bearing the appendage laterally, and the stalk cell of the perithecium terminally. Perithecium asymmetrical, the apex somewhat pointed; separated from its short stalk cell by three basal cells. Appendage clearly distinguished from the receptacle, composed of a basal cell bearing a series of superposed cells, each giving rise from its inner upper angle to a single short septate branch which may bear flask-shaped antheridia. Spores once septate involved in mucus. Asci arising in a double row from a single large ascogenic cell.

### SPHALEROMYCES LATHROBII, nov. sp.

Wholly hyaline or faintly yellowish. Perithecium rather slender, slightly inflated towards the base, tapering to the somewhat pointed apex which is bent inwards; the dividing lines between the wall cells indicated by successive ridges, the distal more prominent: the short stalk cell, separated from the perithecium by three additional cells. Receptacle consisting of two obliquely superposed cells, the upper

bearing the stalk cell of the perithecium distally and the basal cell of the appendage laterally. Appendage borne on a large basal cell connected on its inner side with the distal cell of the receptacle and a portion of the stalk cell of the perithecium, its exterior wall usually much thickened so as to form a more or less distinct rounded prominence at the base of the appendage proper, which consists of a series of four or five obliquely superposed cells diminishing in size towards its apex, from each of which arises on the inner side a single branch; the branches directed obliquely upwards and forming a single series, septate, cylindrical, simple or bearing near their tips single short branches or flask-shaped cells. Spores  $35 \times 3-3.5 \mu$ . Perithecia  $100 \times 22 \mu - 140 \times 36 \mu$ . Total length to tip of perithecium  $160-240 \mu$ . Total length to tip of distal branch of appendage  $110-166 \mu$ . Receptacle  $38-45 \mu$  long.

On *Lathrobium nitidulum* Lec. and *L. punctulatum* Lec. Kittery Point, Maine.

The writer is unable to refer this perplexing yet distinct form to any of the described genera. In general appearance it resembles *Stigmatomyces*, to which it might be referred if the successive cells of the appendage gave rise directly to antheridia. The resemblance, however, is superficial, since the character of the appendage is essentially different. Among the remaining genera it might perhaps be compared with the more simple type of *Ceratomyces*, from which the clear differentiation of its appendage and the structure of its perithecium as well as the character of its antheridia would seem to distinguish it. Specimens from *L. nitidulum* are distinctly smaller than those on the larger host. The species seems to be a rare one, and inhabits the legs and abdomen of its host, where, owing to its small size and pale color, it is detected with difficulty.

#### COMPSOMYCES, nov. gen.

Receptacle consisting of two superposed cells, the distal bearing from its extremity a cluster of appendages and one or more stalked perithecia. Appendages sterile or fertile, simple or branched, septate, the fertile ones bearing one or more single one-celled antheridia separated by oblique partitions from the extremities of successive cells composing the main axis of the appendage. Perithecia symmetrical, conical, borne on two superposed stalk cells and three small basal cells, the basal stalk cell producing from its distal end a simple sterile appendage. Asci 8-spored. Spores once septate.

## COMPSOMYCES VERTICILLATUS.

*Cantharomyces verticillatus* Thaxter.

This species was found not uncommonly on *Sunius longiusculus* at Kittery Point, Me., during the past summer, and an examination of new material shows conclusively that it is generically distinct from *Cantharomyces* as emended in a previous paper. Its antheridia are not compound as in that genus, but simple, more or less flask-shaped and produced in a fashion more closely resembling that of certain species of *Laboulbenia*. The trichogyne is remarkably developed, copiously and regularly several times branched, the free receptive tips being coiled in close and regular spirals.

## MOSCHOMYCES, nov. gen.

Receptacle composed of a sucker-like compacted mass of parenchymatous cells penetrating the softer chitin of the host and giving rise above to numerous free cells from the distal ends of which are produced solitary stalked perithecia and appendages. Perithecium very large, subconical, pointed, the apex symmetrical, borne on two simple superposed stalk cells followed by three small basal cells; the basal stalk cell bearing from its distal end a single simple sterile appendage. Appendages septate, sparingly branched or simple, the fertile ones stouter, bearing one-celled antheridia laterally. Asci subcylindrical, eight-spored, arising in great numbers and in many rows from a single ascogenic cell or centre. Spores minute, acicular, once septate.

## MOSCHOMYCES INSIGNIS, nov. sp.

Perithecia pale straw-colored, becoming tinged with brown, the lower portion slightly inflated and abruptly contracted at the base, the distal portion subconical, sometimes slightly bent to one side, the apex narrow, truncate, symmetrical, the surface marked by two series of ridges extending around the perithecium, each series composed of four distinct and prominent ridges placed somewhat irregularly and indicating the lines of separation between the middle and the upper and lower series of cells which form the walls of the main body of the perithecium: basal cells of the perithecium small, three in number, not distinguished from it but somewhat abruptly distinguished from the distal stalk cell, which is long, subcylindrical, sometimes inflated and curved; the basal stalk cell usually shorter and smaller, bearing distally a single slender simple rather closely septate tapering append-



age, usually about as long as the distal stalk cell. The appendages, which together with the single stalked perithecia spring in groups of three or four from the distal ends of large cylindrical cells projecting from the sucker-like receptacle (more rarely arising from the latter directly), are simple or once branched, either sterile or producing the supposed antheridia on short branches near their extremities. Spores very minute, acicular, septate near the middle,  $12 \times 3 \mu$ . Asci subcylindrical,  $40-45 \times 7.5 \mu$ , eight-spored, the spores sub-distichous. Perithecia  $225-290 \times 55-75 \mu$ , the stalk cells (longest)  $425 \mu$ , average  $375 \times 25 \mu$ . Appendages  $175-375 \mu$  long. Breadth of sucker-like receptacle  $75 \mu$ .

On *Sunius prolixus* Er. Waverly, Mass.

This form, which is among the most remarkable thus far discovered, differs from all other genera in the structure of its attachment to the host. It inhabits only the softer chitinous membranes, beneath the elytra and at the bases of the legs or between the segments, which it perforates by the intrusion of its sucker-like base. It is more nearly allied to *Compsomyces* than to any other known genus. The minute spores are formed in enormous numbers and discharged in masses. The asci arise from a single centre, apparently a single cell, in numerous rows, and are distinctly eight-spored.

### TERATOMYCES THAXTER.

Three additional species of this genus, two of which are described below, represent a well marked type adhering closely to that previously described. The discharge of antherozoids has been observed in fresh material and the antheridia prove to be the beak-like cells characteristic of all the species. The trichogyne has been observed in two species in which it differs widely; in the one case appearing as a branched organ very similar to the ordinary terminal branches of the appendages, while in the other it is highly developed with peculiarly modified receptive tips.

### TERATOMYCES ACTOBII, nov. sp.

Perithecia one to several, reddish brown distinctly inflated towards the base, the distal portion symmetrically conical, tapering to a blunt apex; borne on a single short stalk cell not exceeding the appendages in length followed by three unusually large basal cells disposed as in *T. mirificus*. Receptacle short nearly symmetrical tinged with

brownish or nearly hyaline, consisting of three superposed cells, the basal small and narrow, the sub-basal squarish, the distal large, rounded and followed by the circular series of small cells from which arise the numerous appendages which in general resemble those of *T. mirificus* though proportionately stouter and more intricately branched. Spores  $26 \times 3.7 \mu$ . Perithecia  $120-137 \times 37 \mu$ . Stalk cells  $75-100 \mu$ . Longest appendages  $150 \mu$ . Three basal cells of receptacle  $37 \times 22 \mu$ .

On *Actobius nanus* Horn. Kittery Point, Maine.

This species occurred with the next on the legs of its host. It differs from *T. mirificus* in the form of its perithecia, which are subconical, as well as by its hyaline or nearly hyaline symmetrical receptacle. The short stalk cell and large basal cells of its perithecia serve also to distinguish it.

#### TERATOMYCES BREVICAULIS, nov. sp.

Perithecia several, purplish brown, long, slender, straight or slightly curved, cylindrical or slightly inflated near the middle, tapering abruptly to the almost truncate apex, much longer than the stalk and basal cells together, the latter concolorous with the perithecium, the stalk cell nearly hyaline. Receptacle nearly symmetrical, black and quite opaque, except the partly translucent basal cell; above the opaque portion expanding abruptly to form the broad distal portion from the numerous small cells of which arise, around the edge, the circle of crowded appendages which surround the perithecia. Larger appendages faintly tinged with brownish purple, consisting of a rather short basal cell bearing a short series of superposed external branches, the uppermost consisting of a large, long basal cell curved and somewhat inflated distally, where it bears externally a series of two to five secondary branches similarly shaped which may in turn be similarly branched, the ultimate branchlets bluntly pointed with numerous slightly oblique septa or terminating in long beak-like cells (antheridia). Spores  $33 \times 4 \mu$ . Perithecia  $110-120 \times 23 \mu$ . Stalk cells  $50 \times 15 \mu$ . Receptacle  $85 \times 50 \mu$ . Longest appendages  $100 \mu$ .

On *Actobius nanus* Horn. Kittery Point, Maine.

This curious species is quite distinct from that with which it was associated on the same host, and differs in the form of its perithecia and appendages as well as the peculiar and abrupt distal expansion of its receptacle. Both of the types, which occurred at the tip of the abdomen of the host, have three perithecia.



## CANTHAROMYCES PUSILLUS, nov. sp.

Perithecium becoming reddish brown, inflated just above the base, the distal portion conical tapering to a blunt symmetrical apex, borne on a rather short narrow stalk cell bent towards the appendage and separated from the perithecium by three small subtriangular basal cells. Receptacle consisting of a very small basal and a much larger rounded sub-basal cell, more or less suffused with brown, which gives rise to the stalk cell of the perithecium and the appendage. Antheridial appendage consisting of a large squarish basal cell followed by the antheridium proper, which is primarily a large squarish cell, its outer half or more becoming divided by anastomosing septa into numerous small cells, the inner portion also showing a division into two or three larger cells; the whole bearing terminally a series of usually three superposed flattened cells strongly constricted at the septa and giving rise distally to from one to three simple cylindrical nearly hyaline sparingly septate branches, usually exceeding the perithecium in length. Spores  $18 \times 2 \mu$ . Perithecia  $22-26 \times 30-55 \mu$ . Total length to tip of perithecia  $80-85 \mu$ , to tip of appendages  $90-120 \mu$ .

On *Trogophlæus* sp. York, Maine; Waverly, Mass.

This species is perhaps the smallest of the known forms of Laboulbeniaceæ, and is somewhat difficult to discover and remove from the legs or elytra of its host, where, however, it is not rarely found. Owing to its minute size the detailed structure of the antheridium was not plainly made out, neither was any discharge of antherozoids noticed. It corresponds so closely, however, to the structure characteristic of the genus as emended, that there can be little doubt of the correctness of its generic reference.

## CAMPTOMYCES, nov. gen.

Receptacle consisting of two superposed cells, the upper bearing the short-stalked perithecium laterally and the antheridial appendage terminally. Perithecium narrow, with coarse-lipped asymmetrical apex. Appendage consisting of a single large basal cell bearing the antheridium terminally. Antheridium multicellular, subconical, with a prominent terminal pore for the discharge of the numerous roundish antherozoids. Trichogyne developed as a small vesicular prominence above a permanent ear-like appendage which arises laterally from the young perithecium. Ascogenic cells two in number.

## CAMPTOMYCES MELANOPUS, nov. sp.

Perithecium tinged with brownish, slightly inflated towards the base, its distal half narrow, tapering gradually to the rounded apex below which on one side is a rounded projection; borne on a large subtriangular stalk cell surmounted by three smaller basal cells. Receptacle narrowly funnel-shaped, tapering to a pointed base and consisting of a large basal cell, slightly translucent near its lower extremity, but otherwise becoming wholly opaque, followed by a flattened sub-basal cell from which the mature perithecium with its stalk projects nearly at right angles to the long axis of the receptacle, while distally it bears the appendage. Appendage bearing terminally the subconical slightly asymmetrical antheridium. Spores about  $25 \times 3.5 \mu$ . Perithecium  $130-150 \times 30-33 \mu$ . Total length to tip of antheridium  $110-125 \mu$ . Greatest width  $25 \mu$ . Antheridium  $25 \times 16 \mu$ .

On *Sunius prolixus* Er. Waverly, Mass., and York, Maine.

This curious form affords an additional example of a highly developed type of antheridium which has neither the peculiar honeycomb-like appearance of *Cantharomyces* and *Haplomyces* nor the more simple type of *Peyritschiella* and its allies, *Dichomyces* and *Heimatomyces*. It is distinguished from the two genera first named by having a strictly terminal pore without appendages of any kind. It shows a clearly defined cavity within which the spermatia are formed which is surrounded on three sides (wholly near its base) by several rows of cells not symmetrically disposed. The species occurs rather rarely on the abdomen of its host, the perithecia being usually directed forward.

## PEYRITSCHIELLA GEMINATA, nov. sp.

Hyaline. Receptacle asymmetrical, consisting of a single basal cell followed by three successive more or less definite transverse rows of cells. The lowest of these rows is the most variable and irregular, consisting of from two to four cells, one of which, larger than the rest, is an axile cell continuing the basal cell directly, while the remaining one to three cells are cut off from it on one side, each successive cell smaller and placed higher in the series, the outermost and uppermost bearing one of the sterile appendages characteristic of the genus. The second row also consists of a larger axile cell, which is free for a short distance on one side, and on both sides of which are cut off, as in the first row, from two to four cells, the smaller uppermost ones on both sides giving rise to from one to three appendages according to the

number of the cells. The upper row is either symmetrical or asymmetrical according as it gives rise to two or to only one perithecium. In the first instance it consists of an axile cell, above which are produced two sterile appendages, and a variable number of cells cut off laterally as in the lower rows, but nearly symmetrical in size and shape, the outermost bearing sterile appendages. If one perithecium only is produced the row is asymmetrical and a greater number of appendages appear on one side of the perithecium than on the other. Perithecia very slightly inflated near the base, tapering abruptly but slightly to the spreading apex, which is four-lobed, the lobes rounded, large, and prominent. Spores about  $37 \times 3.7 \mu$ . Perithecia  $75-80 \times 18-22 \mu$ . Total length to tip of perithecia  $220-260 \mu$  ( $150 \mu$  in specimens from the smaller host).

On *Pterostichus luctuosus* Dej. and *P. patruelis* Dej. Kittery Point, Maine.

Unlike the other species, this form not infrequently produces two perithecia, the arrangement of its distal cells in such cases closely resembling that of *Dichomyces*. The main body of the receptacle is however asymmetrical, and the minute antheridium as far as can be ascertained from the material obtained occurs only on one side. It forms nevertheless an additional point of connection between the two genera, which may ultimately have to be united, despite the extreme differences between the type species in either case.

#### DICHOMYCES INFECTUS, nov. sp.

Receptacle consisting of a short basal cell succeeded by an axile cell placed vertically, on either side of which a series of three obliquely superposed cells forms a blackened border. The remainder of the receptacle consisting of two successive transverse symmetrical rows of cells, the lower row made up of three central and several smaller external cells terminating on either side in a short blunt projection below the prominent antheridia, beside which arise single sterile appendages. The distal row is composed of seven cells, the external cells on either side not extending beyond the bases of the perithecia and destitute of appendages; two appendages arise between the perithecia, one on either side. Perithecia two, closely approximated, arising from single broad flattened cells, short and stout, tapering slightly towards the subtruncate apex, which is destitute of papillæ or appendages. Perithecia  $66 \times 22 \mu$ . Receptacle  $60 \times 40 \mu$ .

On *Xantholinus obsidarius* Melsh. Waverly, Massachusetts.

Two specimens of this small form were found at the tip of the abdomen of its host.

## DICHOMYCES INÆQUALIS, nov. sp.

Receptacle as in *D. furciferus*, its fork-like projections prominent and indistinctly septate, the distal row of cells bearing a single perithecium but symmetrical except that the submedian cell, above which a second perithecium arises in *D. furciferus*, is much reduced in size. Appendages ten to twelve, one at the base of each antheridium, two above the median cell of the distal row, and three to four borne one from each of the three to four cells of the distal row external to the submedian cells, all arising as in *D. furciferus*. Perithecia large, slightly inflated towards the base or subcylindrical, tapering abruptly at the extremity to a subtruncate apex destitute of appendages. Spores  $26 \times 3.5 \mu$ . Perithecia  $100 \times 25 \mu$ . Receptacle, length to base of perithecium  $92 \mu$ ; length to tips of lateral forks  $110-130 \mu$ ; greatest breadth  $50-60 \mu$ . Total length to tip of perithecium  $180-190 \mu$ .

On *Philonthus debilis* Grav. Kittery Point, Maine, and Waverly, Massachusetts.

This species occurs sometimes in company with *D. furciferus* on the abdomen, more rarely on the legs and thorax of its host. It is at once distinguished by its solitary perithecium, which is destitute of the ear-like appendages peculiar to the last named species. The presence of a single perithecium necessitates a modification of the generic diagnosis in this respect, but despite the absence of the usual pair, which seems to be invariable, the bilateral symmetry of the plant is otherwise maintained. More abundant material of *D. furciferus* shows the presence of an appendage placed beside each antheridium, a character also found in both the new species just described.

## HEIMATOMYCES AURANTIACUS, nov. sp.

Pale straw-colored, the cell contents including numerous rather bright orange granules or oil globules. Perithecium, exceeding the tip of the receptacle by from one fifth to one quarter of its length, small, slender, the tip usually curved outwards, the lips rather prominent. Receptacle slender, the basal cell suffused with brown below, the sub-basal cell small and flat, the two succeeding cells elongate, the outer shorter and continued above by an unusually large basal cell of the perithecium: distal portion of the receptacle as in *H. borealis* composed of three cells, the two lower very long and narrow, subtriangular, obliquely superposed, their lower extremities nearly touching the sub-basal cell. Perithecium  $50 \times 14-15 \mu$ . Total length to tip of

receptacle 85-90  $\mu$ ; to tip of perithecium 100-110  $\mu$ . Greatest breadth 22  $\mu$ .

On *Desmopachria convexa* Aube. Kittery Point, Maine.

A rare species occurring on the right elytron near the middle of its distal half. Distinguished from *H. orientalis*, which occurs also very rarely on the same host, and *H. Bidessarius*, by its slender form and orange color as well as the details of its structure. It is a very delicate species, seldom found in good condition.

#### DIMORPHOMYCES NUTICUS, nov. sp.

Male individual as in *D. denticulatus*, the basal cell more or less suffused with blackish.

Female individual. Receptacle consisting of three superposed cells, the basal cell becoming subtriangular through the successive separation, from its upper angles on either side, of a transverse series of cells, each of which gives rise to a single perithecium or a single sterile appendage in regular succession. Appendages simple, single, septate, seldom equalling the perithecia in length. Perithecia one to six, becoming slightly brownish and curved, subclavate, notched on one side below the truncate or bluntly rounded asymmetrical apex and destitute of any tooth-like outgrowth. Spores 22-25  $\times$  3  $\mu$ . Perithecia 75-90  $\times$  15  $\mu$ . Total length to tip of perithecia 90-130  $\mu$ .

On *Falagria dissecta* Er. Maine and Massachusetts.

This species corresponds essentially in structure with *D. denticulatus*, from which it is readily distinguished by its perithecia, which are larger and without the peculiar tooth-like appendage of the last named species. The male individuals can hardly be distinguished except for the suffusion of the basal cell.

In the following synopsis the genus *Hesperomyces* Thaxter has been dropped as synonymous with *Stigmatomyces*, and all published species have been included, without regard to certain probable cases of synonymy. The arrangement suggested is entirely provisional, yet indicates in a general way the natural sequence of the genera.

I. ANTHEROZOIDS ENDOGENOUS.

A. ANTHERIDIA COMPOSED OF SEVERAL CELLS.

§ Diœcious . . . . . DIMORPHOMYCES

1. On *Falagria dissecta* Er. . . . . *denticulatus*.

2. On *Falagria dissecta* Er. . . . . *muticus*.

§§ Monœcious.

\* Antheridium borne on an appendage free from the receptacle.

a. Antheridium lateral below a terminal branch of the  
appendage . . . . . CANTHAROMYCES

1. On *Bledius assimilis* . . . . . *Bledii*.

2. On *Bledius armatus* Er. . . . . *occidentalis*.

3. On *Trogophlæus* sp. . . . . *pusillus*.

b. Antheridium terminal tipped by a spine-like process.  
HAPLOMYCES

1. On *Bledius ornatus* Lec. . . . . *californicus*.

2. On *Bledius rubiginosus* Er. . . . . *texasus*.

3. On *Bledius emarginatus* Say . . . . . *virginianus*.

c. Antheridium terminal with a prominent apical pore.  
CAMPTOMYCES

1. On *Sunius prolixus* Er. . . . . *melanopus*.

\*\* Antheridium united to the body of the receptacle from which its pointed  
apex projects.

a. Perithecia terminal, free from the asymmetrical recep-  
tacle. Terrestrial . . . . . PEYRITSCHIELLA

1. On *Platynus cincticollis* (Say) . . . . . *curvata*.

2. On *Platynus cincticollis* (Say) . . . . . *minima*.

3. On *Plerostichus luctuosus* Dej. and *P. patruelis*  
Dej. . . . . *geminata*.

4. On *Philonthus debilis* Grav. . . . . *nigrescens*.

b. Perithecia terminal, free from the symmetrical recep-  
tacle. Terrestrial . . . . . DICHOMYCES

1. On *Philonthus debilis* Grav. . . . . *furciferus*.

2. On *Philonthus debilis* Grav. . . . . *inæqualis*.

3. On *Xantholinus obsidarius* Melsh. . . . . *infectus*.

c. Perithecium wholly or partly united to the asymmet-  
rical receptacle on one side. Aquatic HEIMATOMYCES

1. On *Haliplus ruficollis* DeG. and *Chemidotus*  
*muticus* Lec. . . . . *Halipli*.



2. On *Laccophilus maculosus* Germ., *L. hyalinus* Dej., and *L. minutus* Sturm . . . . . *paradoxus*.
3. On *Laccophilus maculosus* Germ. . . . . *appendiculatus*.
4. On *Laccophilus hyalinus* Dej. and *L. minutus* Sturm . . . . . *melanurus*.
5. On *Laccophilus maculosus* Germ. *Hydroporus spurius* Lec. and *sp. indet.* . . . . *marginatus*.
6. On *Laccophilus maculosus* Germ. and *Hydroporus spurius* Lec. . . . . *rhyncostoma*.
7. On *Laccophilus maculosus* Germ. . . . . *lichenophorus*.
8. On *Laccophilus maculosus* Germ. and *Hydroporus spurius* Lec. . . . . *uncinatus*.
9. On *Laccophilus maculosus* Germ. . . . . *hyalinus*.
10. On *Laccophilus maculosus* Germ. and *Hydroporus sp.* . . . . . *affinis*.
11. On *Laccophilus maculosus* Germ., *Hydroporus spurius* Lec., and *gen. indet.* . . . . . *simplex*.
12. On *Bidessus granarius* Aube . . . . . *Bidessarius*.
13. On *Desmopachria convexa* Aube . . . . . *borealis*.
14. On *Desmopachria convexa* Aube . . . . . *aurantiacus*.

B. ANTHERIDIA COMPOSED OF SINGLE CELLS.

Diœcious . . . . . AMORPHOMYCES

1. On *Falagria dissecta* Er. . . . . *Falagriae*.
2. On *Bledius basalis* Lec. . . . . *floridanus*.

§ Monœcious.

\* Antheridia borne in definite series on the appendages.

γ Antheridia springing directly from successive cells of the appendage.

- a. Appendage solitary, bearing the antheridia in several vertical series . . . . . HELMINTHOPHANA
  1. On *Nycteribia Dufourii* . . . . . *Nycteribiae*.
- b. Appendage solitary, bearing the antheridia in a single vertical series . . . . . STIGMATOMYCES
  1. On *Drosophila nigricornis* Loew. . . . . *entomophila*.
  2. On *Musca domestica* L. . . . . *Baeri*.
  3. On *Chilocorus bivulnerus* Muls. . . . . *virescens*.
- c. Appendages numerous, arising directly from the receptacle, bearing the antheridia in a single vertical series . . . . . IDIOMYCES
  1. On *Deleaster dichrous* Grav. . . . . *Peyritschii*.

γγ Antheridia borne on branches of the appendages.

- d. Appendages several, the antheridia borne on lateral branches in a single vertical series . . . CORETHROMYCES
1. On *Cryptobium pallipes* Grav. and *C. bicolor* Grav. *Cryptobii.*
  2. On *Lathrobium nitidulum* Lec. . . . . *setigerus.*
  3. On *Lathrobium jacobinum* Lec. and *L. collare* Er. *jacobinus.*
- e. Appendage single, with terminal sterile branches; antheridia borne below its successive septa as lateral branches, often branched or irregular RHADINOMYCES
1. On *Lathrobium nitidulum* Lec. and *L. punctulatum* Lec. . . . . *cristatus.*
  2. On *Lathrobium fulvipenne* Grav., *L. punctulatum* Lec., and *L. angulare* Lec. . . . . *pallidus.*

\*\* Antheridia not borne in any definite series on the appendage.

- a. Receptacle of two superposed cells, the upper bearing several appendages and one or more stalked perithecia . . . . . COMPSOMYCES
1. On *Sunius longiusculus* Mann. . . . . *verticillatus.*
- b. Receptacle closely multicellular, bearing numerous vertical cells from which arise terminally several appendages and solitary stalked perithecia MOSCHOMYCES
1. On *Sunius prolixus* Er. . . . . *insignis.*
- c. Receptacle typically nine-celled; the appendages two or more, terminal, the inner fertile . . . LABOULBENIA
1. On *Anchomenus viduus* Pz., *A. albipes*, and *Platynus extensicollis* Say . . . . . *anceps.*
  2. On *Harpalus pennsylvanicus* DeG. . . . . *arcuata.*
  3. On *Antennophorus caput-carabus* . . . . . *armillaris.*
  4. On *Acrogenys hirsuta* Maclean . . . . . *australiensis.*
  5. On *Brachinus mexicanus* Dej. and *spp. indet.* . . . *Brachini*
  6. On *Patrobis longicornis* Say and *P. tenuis* Lec. . . *brachiata.*
  7. On *Casonia pennsylvanica* Dej. . . . . *Casoniæ.*
  8. On *Catoscopus guatemalensis* Bates . . . . . *Catoscopi.*
  9. On *Clivina dentifemorata* Putz. . . . . *Clivinae.*
  10. On *Bembidium spp. indet.* . . . . . *compacta.*
  11. On *Anisodactylus baltimorensis* Say . . . . . *compressa.*
  12. On *Harpalus pennsylvanicus* DeG. . . . . *conferta.*
  13. On *Platynus extensicollis* Say . . . . . *contorta.*
  14. On *Coptodera Championi* Bates . . . . . *Coptoderae.*

15. On *Pæderus littorarius* Grav., *P. oblitteratus* Lec.,  
*P. ruficollis* Fabr., and *sp. indet.* . . . . . *cristata.*
16. On *Bembidium bimaculatum* Kirby . . . . . *curtipes.*
17. On *Harpalus pennsylvanicus* DeG. . . . . *elegans.*
18. On *Platynus cincticollis* (Say) . . . . . *elongata.*
19. On *Chlænium aneocephalus* Dej., *C. Chrysocephalus* Rossi, *Callistus lunatus* Fabr., and *Ap-  
tinus mutilatus* Fabr. . . . . *europæa.*
20. On *Chlænium vestitus* F. . . . . *fasciculata.*
21. On *Anisodactylus Harrisii* Lec., *A. nigerrimus*  
Dej., and *A. interpunctatus* Kirby . . . . . *filifera.*
22. On *Bembidium lunatum* Duft., *Anchomenus al-  
bipes* F., and *A. marginatus* L. . . . . *flagellata.*
23. On *Platynus cincticollis* (Say) . . . . . *fumosa.*
24. On *Galerita janus* Fabr., *G. mexicana* Dej., *G.  
atripes* Lec., and *sp. indet.* . . . . . *Galeritæ.*
25. On *Platynus extensicollis* Say . . . . . *gibberosa.*
26. On *Gyretes sericeus* Lab., *G. compressus* Lec., and  
*G. sinuatus* Lec. . . . . *Guerinii.*
27. On *Gyrinus fraternus* Coup., *G. affinis* Aube, *G.  
aralis* Say, *G. confinis* Lec., *G. consobrinus*  
Lec., *G. plicifer* Lec., *G. ventralis* Kirby, *G.  
urinator* Illig., and *spp. indet.* . . . . *Gyrinidarum.*
28. On *Harpalus pennsylvanicus* DeG. . . . . *Harpali.*
29. On *Bradycellus rupestris* Say . . . . . *inflata.*
30. On *Galerita leptodera* Chaud. . . . . *longicollis.*
31. On *Bembidium varium* Oliv. and *spp. indet.* . . . . *luxurians.*
32. On *Galerita mexicana* Chaud., *G. nigra* Chev.,  
and *G. æquinotialis* Chaud. . . . . *mexicana.*
33. On *Calleida pallidipennis* Chaud. . . . . *minima.*
34. On *Morio georgiæ* Pal. . . . . *Morionis.*
35. On *Nebria pallipes* Say, *N. Sahlbergi* Fisch,  
*N. Gregaria* Fisch, *N. Brunnea* Duft., and *N.  
Villa* Dej. . . . . *Nebriæ.*
36. On *Pachytelis mexicanus* Chaud. . . . . *Pachytelis.*
37. On *Panagæus crucigerus* Say, and *P. fasciatus*  
Say . . . . . *Panagæi.*
38. On *Platynus extensicollis* Say, *P. æruginosus* Dej.,  
and *sp. indet.* . . . . . *parvula*
39. On *Platynus melanarius* Dej., *P. ruficornis* Lec.,  
and *P. extensicollis* Say . . . . . *paupercula.*

40. On *Bembidium* spp. *indet.* . . . . . *pedicellata.*
41. On *Pheropsophus æquinoctialis* Linn., *P. marginatus* Dej., and *spp. indet.* . . . . . *Pheropsophi.*
42. On *Philonthus debilis* Grav., *P. cunctans* Horn, *P. micans* Grav., *P. æqualis* Horn, *P. californicus* Mann., and *spp. indet.* . . . . . *Philonthi.*
43. On *Olisthopus parmatum* Say, *Stenolophus limbalis* Lec., *S. fuliginosus* Dej., *Badister maculatus* Lec., *Harpalus pleuriticus* Kirby, *Agonoderus pallipes* Fabr., and *gen. indet.* . . . . . *polyphaga.*
44. On *Eudema tropicum* Hope, *Chlænienus auricollis* Gory., and *Dolichus?* *sp.* . . . . . *proliferans.*
45. On *Pterostichus adoxus* Say, *P. luctuosus* Dej., *P. manicus* Lec., and *sp. indet.* . . . . . *Pterostichi.*
46. On *Quedius vernilis* Lec. . . . . *Quedii.*
47. On *Platynus extensicollis* Say . . . . . *recta.*
48. On *Brachinus crepitans* L., *B. explodens* Duft., *B. scolopeta* F., and (?) *Platynus cincticollis* Say . . . . . *Rougetii.*
49. On *Platynus extensicollis* Say . . . . . *scolophila.*
50. On *Schizogenius lineolatus* Say, and *S. ferrugineus* Putz. . . . . *Schizogenii.*
51. On *Anophthalmus Menetriesii* Motsch., *A. angustatus* Lec., and *A. Motschulskyi* Schm. . . . . *subterranea.*
52. On *Bembidium* spp. *indet.* . . . . . *truncata.*
53. On *Stenolophus ochropezus* Say . . . . . *umbonata.*
54. On *Anomoglossus pusillus* Say, *Chlænienus æstivus* Say, *C. cumatilis* Lec., *C. cursor* Chev., *C. leucoscelis* Chaud., *C. floridanus* Horn, *C. pennsylvanicus* Say, *C. ruficaudis* Chaud., *C. sparsus* Lec., *C. texanus* Horn, *C. tricolor* Dej., *C. viridicollis* Reiche, *Omophron americanum* Dej., *O. rimbatum* F., and *spp. indet.*, *Patrobus longicornis* Say, *Platynus extensicollis* Say, *Pterostichus adoxus* Say, *P. luctuosus* Dej., *P. corvinus* Dej., *P. caudicollis* Say, and *Nebria pallipes* Say . . . . . *variabilis.*
55. On *Bembidium littorale* Pz., *B. fasciolatum* Duft., *B. punctulatum* Drap., *B. lunatum* Duft., *B. obsoletum*, Dej., and *spp. indet.* . . . . . *vulgaris.*
56. On *Crepidogaster bimaculata* Boh. . . . . *zanzibarina.*

- d. Receptacle two-celled, appendage single, bearing a series of branches superposed in a single row.

## SPHALEROMYCES.

1. On *Lathrobium nitidulum* Lec. and *L. punctulatum* Lec. . . . . *Lathrobii*.

- e. Receptacle of numerous cells superposed in a single series giving rise directly on one side to fertile appendages, one or two perithecia, and sterile appendages in the order named . . . . CHÆTOMYCES

1. On *Pinophilus latipes* Er. . . . . *Pinophilii*.

- f. Receptacle consisting of a primary axis of several to many superposed cells and a secondary series of smaller cells irregularly placed and bearing numerous bristle-like appendages ACANTHOMYCES

1. On *Atranas pubescens* Dej. . . . . *lasiophora*.

2. On *Lathrobium longiusculum* Grav. and *sp. indet.* *Lathrobii*.

3. On *Lathrobium fulvipenne* Grav. . . . . *brevipes*.

4. On *Othius fulvipennis* Fab. . . . . *furcatus*.

5. On *Anophthalmus Bilimeki* Sturm. . . . . *hypogæus*.

6. On *Colpodes evanescens* Bates . . . . . *longissimus*.

- g. Receptacle multicellular, bearing distally two appendages on either side at the base of a stalked perithecium. . . THAXTERIA (Giard nec Sacc.)

1. On *Mormolyce phyllodes* Hagenb. . . . . *Kunkelii*.

- h. Receptacle of three cells terminated by a horizontal series of numerous cells bearing a circle of appendages and one or more stalked perithecia surrounded by them . . . . . TERATOMYCES

1. On *Acylophorus pronus* Er. . . . . *mirificus*.

2. On *Actobius nanus* Horn. . . . . *Actobii*.

3. On *Actobius nanus* Horn. . . . . *brevicaulis*.

## II. ANTIHEROZOIDS EXOGENOUS. Typically aquatic.

- a. Receptacle of few or many superposed cells, running into the branch bearing appendage on one side and the wall of the perithecium on the other, the wall cells of the latter superposed in four many-celled rows . . . . . CERATOMYCES

1. On *Tropisternus glaber* Hb. and *T. nimbatus* Say *mirabilis*.

2. On *Tropisternus glaber* Hb. . . . . *camptosporus*.
  3. On *Hydrocombus fimbriatus* Melsh. and *Philly-*  
*drus cinctus* Say . . . . . *rostratus*.
  4. On *Tropisternus glaber* Hb. and *T. nimbatus* Say *filiformis*.
  5. On *Tropisternus nimbatus* Say . . . . . *minisculus*.
  6. On *Lathrobium punctulatum* Lec. . . . . *terrestris*.
  7. On *Berosus striatus* Say . . . . . *contortus*
  8. On *Berosus striatus* Say . . . . . *furcatus*.
  9. On *Berosus striatus* Say . . . . . *humilis*.
- b. Receptacle parenchymatously multicellular, numer-  
ous perithecia and appendages arising from  
its cup-shaped extremity . . . . . ZODIOMYCES.
1. On *Hydrocombus lacustris* Lec., *H. fimbriatus*  
Melsh., and *gen. indet.* . . . . *vorticellarius*.